Claims

What is claimed is:

1. A circuit for measuring power transfer between a first node and a second node comprising:

a coupler circuit comprising:

a first port directly connected to the first node for receiving a RF output signal and a second port directly connected to the second node for providing the RF output signal therefrom, the first transmission line for propagating the RF output signal between the first port and the second port, a third port and a fourth port, the fourth port for providing a first signal indicative of forward propagating RF energy propagating from the first port to the second port and the third port for providing a second signal indicative of backwards propagating RF energy propagating from the second port to the first port; and,

detection circuitry comprising:

a first input port coupled to the third port for receiving the first signal indicative of forward propagating RF energy;

a second input port coupled to the fourth port for receiving the signal indicative of backwards propagating RF energy;

a first detected energy output signal port for providing a first detected energy output signal; and,

a second detected energy output signal port for providing a second detected energy output signal.

2. A circuit according to claim 1, wherein the detection circuitry comprises a second detector circuit having an input port for receiving the second signal indicative of backward propagating RF energy and having an output port for providing a second intermediate detected signal in dependence upon the second signal indicative of backward propagating RF energy.

3. A circuit according to claim 2, wherein the detection circuitry comprises:

a second reference circuit having an output port for providing a second reference signal therefrom; and,

a second difference amplifier circuit having a first input port, a second input port and an output port, the first input port for receiving the second intermediate detected signal, the second input port for receiving the second reference signal and the output port directly connected to the second detected energy output signal port for providing the second detected energy output signal therefrom.

4. A circuit according to claim 3, wherein the detection circuitry comprises a first detector circuit having an input port for receiving the first signal indicative of forward propagating RF energy and having an output port for providing a first intermediate detected signal in dependence upon the first signal indicative of forward propagating RF energy.

5. A circuit according to claim 4, wherein the detection circuitry comprises:

a first reference circuit having an output port for providing a first reference signal therefrom; and,

a first difference amplifier circuit having a first input port, a second input port and an output port, the first input port for receiving the first intermediate detected signal, the second input port for receiving the first reference signal and the output port directly connected to the first detected energy output signal port for providing the first detected energy output signal therefrom.

6. A circuit according to claim 1, wherein the detection circuitry comprises a first detector circuit having an input port for receiving the first signal indicative of forward propagating RF energy and having an output port for providing a first intermediate detected signal in dependence upon the first signal indicative of forward propagating RF energy.

7. A circuit according to claim 6, wherein the detection circuitry comprises:

a first reference circuit having an output port for providing a first reference signal therefrom; and,

a first difference amplifier circuit having a first input port, a second input port and an output port, the first input port for receiving the first intermediate detected signal, the second input port for receiving the first reference signal and the output port directly connected to the first detected energy output signal port for providing the first detected energy output signal therefrom.

8. A circuit according to claim 1, comprising a regulator circuit, the regulator circuit for providing a regulated supply voltage to the detection circuitry.

9. A circuit according to claim 1, wherein the coupler circuit comprises a main signal path and a coupled signal path capacitively coupled to the main signal path, the main signal path disposed between the first port and the second port and the coupled signal path disposed between the third port and the fourth port.

10. A circuit according to claim 1, wherein the coupler circuit comprises at least a coupling capacitor disposed between the main signal path and the coupled signal path, the at least a coupling capacitor for coupling of a RF signal propagating along the main signal path to the coupled signal path.

11. A circuit according to claim 9, wherein the main signal path is other than disposed on a same semiconductor substrate as the coupled signal path.

12. A circuit according to claim 9, wherein the main signal path and the coupled signal path are disposed on a same semiconductor substrate.

13. A circuit according to claim 1, comprising a first impedance disposed between the third port and a ground potential.

14. A circuit according to claim 1, comprising a second impedance disposed between the fourth port and a ground potential.

15. A circuit according to claim 1, wherein the coupler circuit comprises a distributed quarter wave coupler circuit.

16. A circuit according to claim 1, wherein the coupler circuit comprises a lumped quarter wave coupler circuit.

17. A circuit according to claim 1, wherein the first and second detectors are such that for a substantial impedance match between the first node and the second node, the first detected energy output signal is substantially zero and second detected energy output signal is substantially maximized.

18. A circuit according to claim 1, wherein the detectors are such that for an other than substantial impedance match between the power amplifier circuit and the first load, the first detected energy output signal is substantially other than zero and second detected energy output signal is substantially other than maximized.

19. A circuit according to claim 1, wherein the circuit is used for wireless applications where the second node is coupled to an antenna for transmitting a wireless RF signal dependent upon the RF output signal.

20. A circuit according to claim 8, wherein the regulator circuit comprises a temperature sensing circuit for sensing a temperature of the circuit and for affecting the regulated supply voltage in dependence thereon.

21. A circuit according to claim 1, wherein the first node comprises an output port of a power amplifier circuit and the second node comprises an input port of a RF antenna.

22. A method of measuring power transfer between a power amplifier circuit for emitting a RF output signal and a first load for receiving the RF output signal comprising the steps of:

providing a coupling circuit having a main signal path and a coupled signal path, the main signal path disposed between the power amplifier circuit and the first load;

propagating a RF output signal along the main signal path to the first load;

coupling forward propagating RF energy and backward propagating RF energy into the coupled signal path;

detecting the forward propagating RF energy to form a first detected energy output signal;

detecting the backward propagating RF energy to form a second detected energy output signal; and,

providing two detected output signals, a first detected signal relating to the forward propagating RF energy and a second detected signal relating to the backward propagating RF energy.

23. A method according to claim 22, comprising the step of determining a VSWR of the power transfer in dependence upon the first detected energy output signal and the second detected energy output signal.

24. A method according to claim 22, wherein the coupled signal path is capacitively coupled to the main signal path.

25. A method according to claim 22, wherein the first detected energy output signal and the second detected energy output signal are used by a feedback control circuit for controlling of the PA.

26. A method according to claim 22, wherein for a substantial impedance match between the power amplifier circuit and the first load, the first detected energy output signal is substantially zero and second detected energy output signal is substantially maximized.

27. A method according to claim 22, wherein for an other than substantial impedance match between the power amplifier circuit and the first load, the first detected energy output signal is substantially other than zero and second detected energy output signal is substantially other than maximized.